Forbes Marshall

Monec 8964

Conductivity / Resistivity
TRANSMITTER

User's Manual

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This user manual corresponds to the Monec 8964 / 8964-EX conductivity / Resistivity transmitter part Nos. 8964/8964-EX and is the June 2005 revision P.C.No. C2013776.

If you experience difficulty with the installation or operation of this equipment, please contact our Customer Service representative.

Manufactured and Marketed by

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Dear User,

Thank you for purchasing the Monec 8964 conductivity/Resistivity transmitter. To maximize your benefits from this product, we request that you read this manual thoroughly before installing the system. A record of the product's maintenance history should be kept in this manual's Field Service Record every time our service representative visits you.

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1 About The Product

The Monec 8964 conductivity/Resistivity transmitter is a Microprocessor operated field mounting instrument to monitor the Conductivity or Resistivity of process solution and transmit 4-20 mA current as a retransmission output. The analyser is designed with modular hardware and user friendly software support. The 8964 range of transmitters are designed to suit intrinsic and non intrinsic applications. In all there are 2 versions of transmitter units in this range.

8964 **:** Non intrinsic version.

8964-EX **:** Intrinsic version.

The Intrinsic versions are marked as EX which correspond to the ignition safety classification “Intrinsic safety” in accordance with IS standard 5780 E Ex ia IIC T5. All these models are compatible to two electrode conductivity sensors with cell constants 0.01, 0.1, 1.0 & 10.

Since the transmitters are Microprocessor operated, all the application specific parameters are field programmable such as cell constant, measuring range, type of temperature compensation, current output format, calibration mode etc.

The unit offers high reliability and easy serviceability due to modular hardware structure reducing maintenance lead time. The software calibration facility allows operation of the instrument without opening the instrument.

1.2 Specifications :

Sensors	Two electrode conductivity sensors with cell constants 0.01, 0.1, 1 & 10 /cm.
Power Supply	15.5 ...30V ; the EX model requires intrinsically safe power supply with 30V/100 ma max.
Load	725 Ω max at 30 volts, 425 Ω at 24 V DC.
Terminals	Screw type, wire dia Φ 2.5 mm max
Temp. Comp.	Automatic : 0 ... 130° C with Pt. 100 Manual : 0... 130° C in steps of 0.1° C
Temp. Ind.	0.... 130°C
Measuring Cycle	< 5 seconds
O/P Signal	4....20 mA load 725 Ω max, at 30 V DC, galvanically isolated
Signal Frequency	70 Hz. / 1100 Hz; jumper selectable by a bridge
Calibration	Computer assisted ; through tactile keyboard
Accuracy	± 1 % of calibrated span (Measurement) ± 1digit (Display) ± 1 °C (Temperature measurement)
Slope adj.	50 - 150 % of the nominal slope at 25 °C.
Data protection	Last measurement is retained during calibration and programming in EEPROM.
Indication	$3^{1/2}$ digit LCD 18-mm height.
Analog output	Resolution 10 bits. Galvanic insulation 2000 V DC Accuracy 1.5 % (Log mode) 0.5 % (Linear mode)

NB : To obtain a relative error less than 1 % when measuring a very high conductivity (a very small resistivity) use a cable of less than 10 mtr. length.

Cable length and range of measurement

Cell Constant^{-1}	Signal Frequency Hz	Range of measurement Conductivity µS/cm...mS/cm / Resistivity kΩ cm... MΩ cm	Cable Length mtrs.
0.01	70	0.01.....0.1 / 100.00... 100.00	100
0.01	1100	0.01.....0.1 / 100.00....100.00	10
0.1	70	0.10.....1.0 / 10.00.....10.00	100
0.1	1100	0.10.....1.0 / 10.00.....10.00	10
1.0	70	1.00.....10.0 / 1.00.....1.00	100
1.0	1100	1.00.....10.0 / 1.00.....1.00	10
10.0	70	10.00...100.0 / 0.10..... 0.10	100
10.0	1100	10.00...100.0 / 0.10.....0.10	10

Enclosure

Material	Epoxy coated cast aluminum
Protection	IP65 as per DN 40050 Nema4; for wall mounting
Dimensions	165H x 165W x 93D mm 200H x 165W x 93D mm with installed cable gland
Cable glands	2 x ½ " NPT, material SS316
Storage temp.	- 20.... + 70 °C
Ambient temp.	- 10... + 50 °C
Weight	1.9 kg
Packaging	5 ply corrugated box
Front Label	UV resistant polycarbonate

1.3 Operating Principle

The two wire transmitters are characterised by only two leads serving both as a source of power supply and a means for analog signal transmission in the form of a 4.. 20 mA DC current. The entire hardware is structured as functional modules assembled together. The DC power supply is converted in split supplies required to drive the processing circuit through a Power pack assembly which is potted for environmental protection and a long sustained life. The measuring cell is powered by a sinusoidal voltage of known amplitude. The frequency of this excitation signal can be selected as either 70 Hz. or 1100 Hz. by a jumper (STR1) on Power Supply board. This signal is delivered by an oscillator of low output impedance to minimise cable capacitance effect. A stable amplifier converts the current going through the probe in a voltage by means of a synchronous detector, which eliminates the effect of external interferences and capacities.

A special Analog to Digital converter digitises the analog voltage suppressing noise signals, thereby providing for more accurate pH and temperature measurements. The digital data is further processed by a dedicated microprocessor to perform auxiliary functions as display, retransmission output generation, calibration, enabling programming and co-relating programmed data to actual processing. The results are displayed on a 3 1/2 digit LCD display. The application specific parameters such as measuring range, calibration mode and type of temperature compensation are field programmable.

The measured conductivity is temperature dependent. This relation is explained in two different modes as follows :

Linear mode : Conductivity as function of temperature is given as

$$C_t = C_{25}\{1 + \alpha(t - 25\}$$

where Ct $\Longrightarrow$ Conductivity at temperature t
α $\Longrightarrow$ Temperature coefficient expressed in % / °C
t $\Longrightarrow$ Process temperature in °C

Non-linear mode : Conductivity is expressed in this mode as :

$$C_{25} = \frac{Ct - CH_2O(T)}{I\,NaCl\,(T)} \times I\,NaCl\,(25) + CH_2O\,(25)$$

I NaCl $\Longrightarrow$ Ionic conductivity of NaCl
where CH_2O $\Longrightarrow$ Conductivity due to ultrapure water
Both these parameters are given by tables.

The block diagram shown in FIG. 1 gives a clear picture of data routing and different functional blocks interconnected.

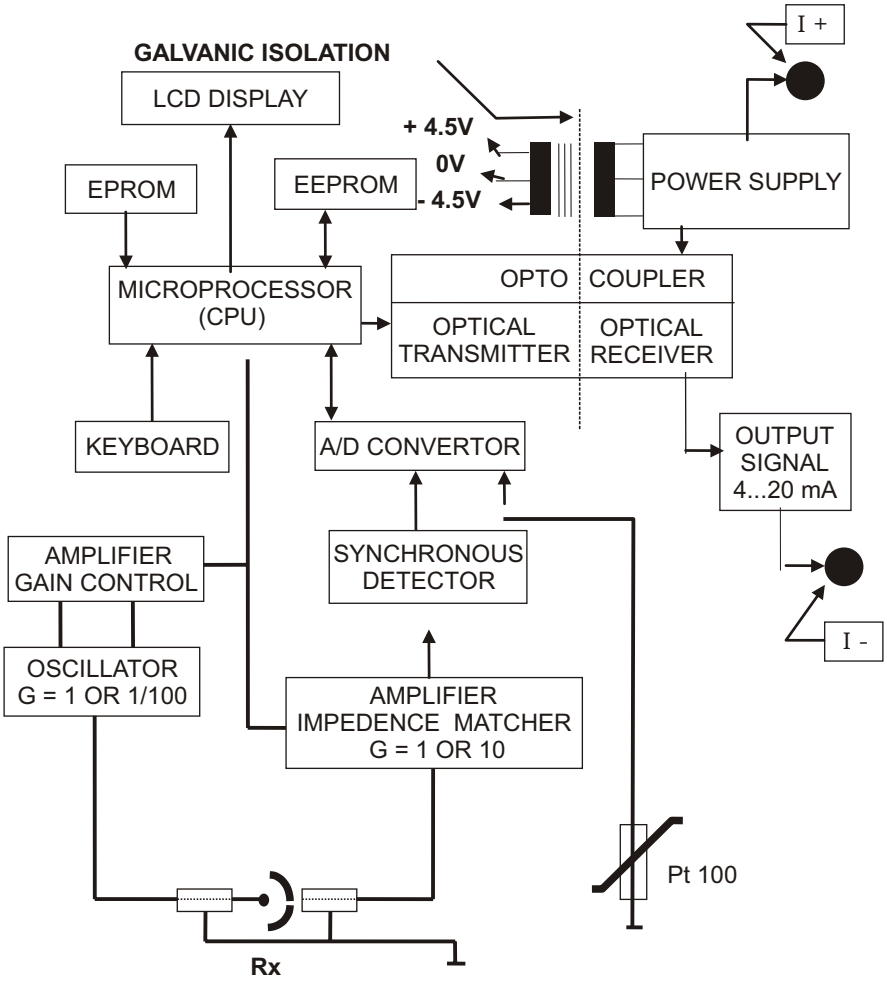


FIG 1 : BLOCK DIAGRAM

2 Getting Started

2.1 Included Items

When you unpack the carton, use the following checklist to make sure that all of these critical components are present:

1.	Transmitter		1 no.
2.	Instruction Manual		1 copy
3.	2" NB Pipe mounting kit consisting of		
	I.	Pipe mounting bracket (integral with transmitter)	1 no.
	II.	M6 x 20 L bolts 4 nos. } Used to fit bracket With transmitter	
	III.	M6 spring washers	4 nos.
	IV.	M6 hex nuts	4 nos.
	V.	'U' clamps } Integral with each other	2 nos.
	VI.	M8 hex nuts	4 nos.
	VII.	BSW washers	4 nos.

2.2 What You Need

1) 3 $^{1/2}$ digit multimeter
2) pH/ RTD calibrator
3) Screw driver blade width 6 mm.
4) Instrument screw driver blade width 3 mm.
5) Spanner for M6 nuts.
6) Spanner for M8 nuts.
7) Spanner for 25A/F for cable glands.

2.3 Mounting

The transmitter can be mounted either on wall or on a 2" NB pipe.

2.3.1 Wall mounting

The casting has 4 holes in four corners as shown in FIG 2.1. The transmitter can be installed in sequence as follows. Since unit has factory fitted wall mounting bracket, it needs to removed for mounting on external wall

I. Drill 7 MM through holes in the suitable plate on which the transmitter is to be mounted.
II. Hold the unit flat on the mounting plate and insert M6 x 20 L bolts through the four corner holes.
III. Fix 4 nos. of M6 spring washers and nuts from the rear end of the mounting plate.
IV. Hold the nuts and tighten the bolts with the help of suitable spanner. This completes mounting the transmitter in place.

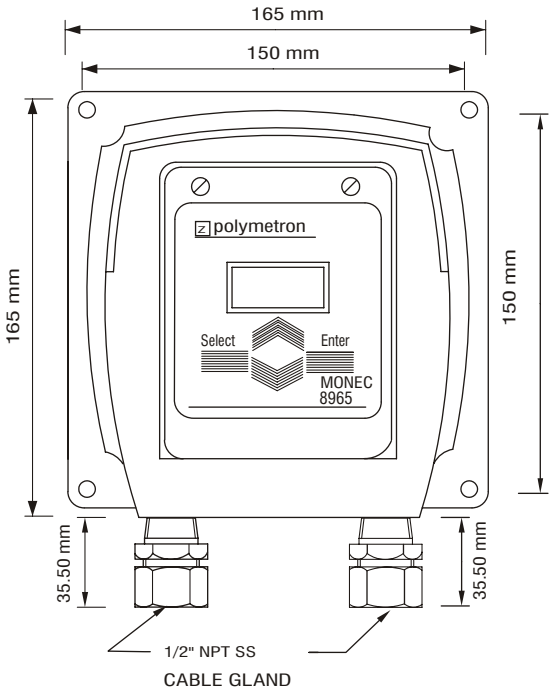


FIG 2. : Wall mounting of Transmitter

2.3.2 Pipe mounting

The 2" NB pipe mounting kit is supplied along with the Transmitter unit which could be used to mount the transmitter on a 2" NB pipe.The dimensional details of pipe mounting arrangements are as shown in FIG 2.2. The sequence of mounting is as follows :

I. Hold the transmitter and the mounting bracket firmly on a pipe and insert 2 nos. of 'U' clamps through the mounting bracket.

II. Fix the mounting bracket firmly on the pipe using 5/16" washers and M8 nuts.

III. Ensure that the transmitter and the mounting bracket are held properly on the pipe. This completes pipe mounting of the transmitter.

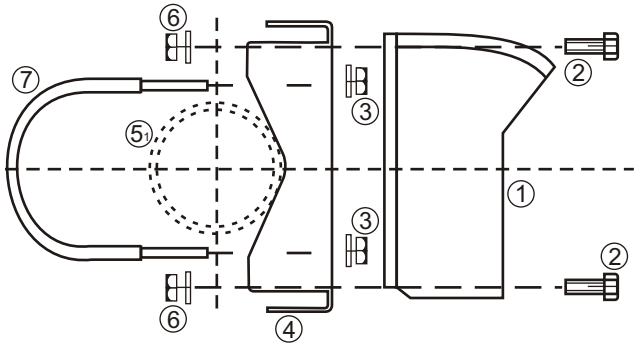


FIG 2.2 (A) : Horizontal pipe mounting of transmitter (SIDE VIEW)

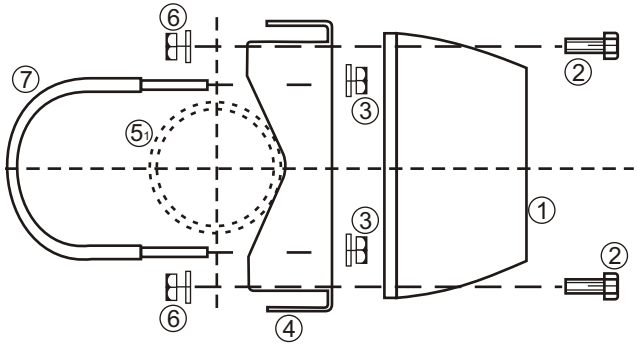


FIG 2.2 (B) : Vertical pipe mounting of transmitter (TOP VIEW)

1 : MONEC transmitter

2 : M6 x 20 Bolts to fix transmitter to mounting bracket.

3 : M8 hex nuts and 5/16" washers to fix 'U' clamps to mounting bracket.

4 : Mounting bracket

5 : Standard 2" NB pipe

6 : M6 hex nuts and M6 spring washers to fix transmitter to mounting bracket.

7 : 'U' clamps to hold transmitter on mounting bracket to standard 2" NB pipe

2.4 Electrical connections

All the cables should be routed through the cable glands and rubber seals of the glands before the wires are terminated on the connectors. Care should be taken to avoid mechanical damage while stripping the cables.

One the instrument is suitably mounted, open the transmitter by unscrewing 2 nos. of knurled captive screws on the transmitter. Shown below in is a part view of the PCB which ill be observed on opening.

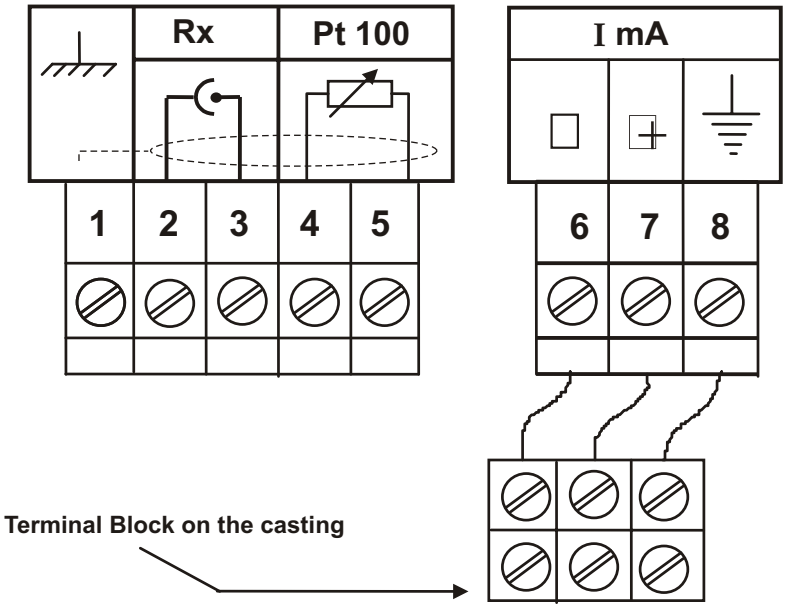


FIG4 : Field connections for 8964 & 8964-EX

2.4.1 Sensor Connections

The connections for the conductivity sensor and the temperature sensor should be made as follows.

Terminal No.	Wire Description
2	Conductivity sensor electrode (any one of the two)
3	Conductivity sensor electrode (remaining one)
4	pt 100 (one end)
5	pt 100 (other end)

In most of the conductivity sensors, the temperature sensor is inbuilt. It is necessary to identify the wires belonging to the temperature sensors and those of the conductivity electrodes before making the connections.

Considerations in hazardous locations

For mounting of transmitter in safe area ,any version is suitable i.e. 8964 or 8964Ex.

However for mounting of transmitter in hazardous locations only the 8964Ex version must be used. Further following conditions must be

The power must be supplied by a certified intrinsically safe power supply.

2.4.1.1 Connections of conductive sensor type 8310, 8311 & 8312

In many cases conductivity sensors are provided as part of a routine conductivity measuring system.

Model 8310 - for cell constant K =0.01 cm-1

Model 8311 - for cell constant K=0.1 cm -1

& Model 8312 - for cell constant K=1 cm -1

All models have inbuilt temp. sensor. Pt - 100

The cells contain male connector as part of the cell body. Hence these cells are provided with a cable having mating female connector at one end. The other end of cells contains wires which are to be connected to the transmitters.

Identifications of the wires belonging to temp. sensor & the conductivity electrodes is done by the colour of the wires as given below.

sensor inner electrode - White

sensor outer electrode - Red

Temp. sensor (pt100) - Black

Temp. sensor (pt100) - Blue

Earth - Shield

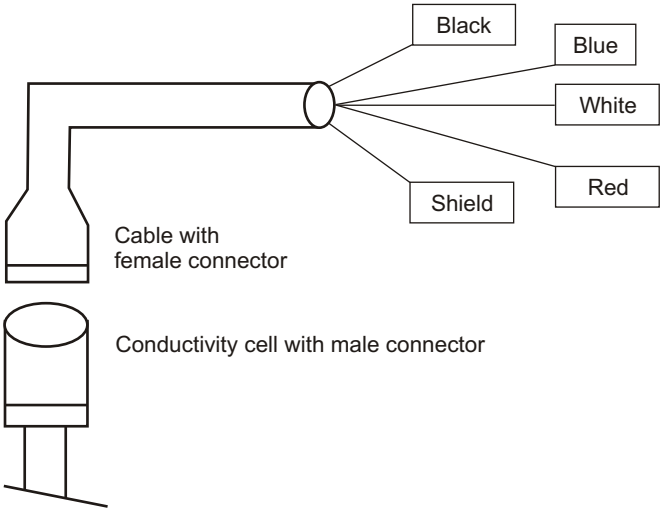


Fig 5 : Conductivity cell & cell cable

2.4.2 Power supply current o/p conductivity

From the terminal 6,7 & 8 wires have been routed internal to the transmitter housing, to a 3 way terminal block as shown in figure,

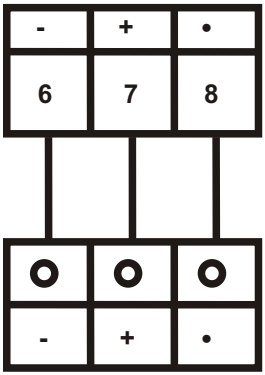


Fig 6 : Power Supply Connections for 8964 / 8964 Ex

Connect the power supply wires at the terminal block. Being a 2 wire the current output is available through these same wires.

To connect to a 4-20mA the current i/p input terminals of the must be in series with the power supply & the see fig. 7

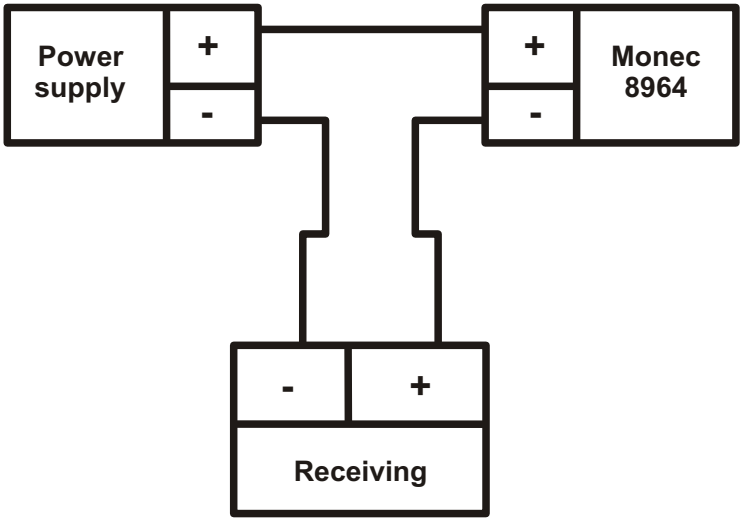


Fig 7 : Looping a Transmitter with power supply & receiver

More than one receiver can be connected in the series, keeping in mind correct polarity. Also ensure that the loop resistance does not record 425 ohms for 24 V supply

2.5 Commissioning the Product

- Ensure that the transmitter is mounted firmly on a panel or a pipe as required.
- Check all the connections of sensor and signal terminals.
- Ensure that the conductivity probe and Pt 100 are mounted properly.
- Verify the programming for correct parameters entered as per process requirement.
- Calibrate the system. Read section 3.5.

3 Operation and Maintenance

3.1 Front Panel Details

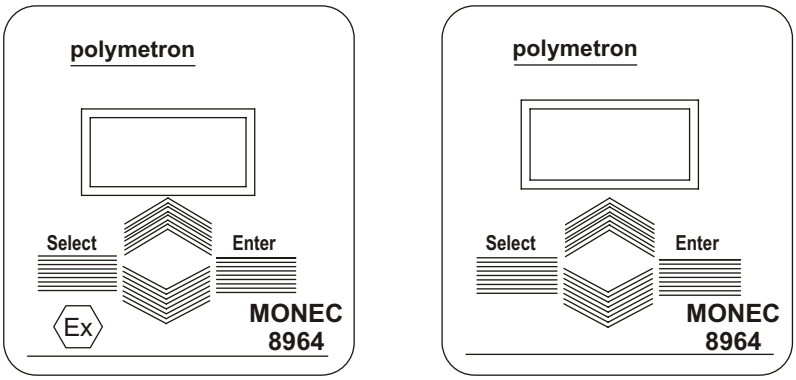


FIG 8: Front panel

Fig 8 shows the front facia for the transmitters, The “Ex” symbol indicates that the instrument has intrinsically safe electronics.

The four nos. of keys can be grouped as

1) The Rollkeys

Increase the value **Decrease the value**

Upon first pressing the rollkeys, the selected values change slowly in steps. After approximately 10 steps, the rate of change accelerates and the desired setting is quickly reached.

2) The Select key

Pressing **Select** while in the measurement mode transfers the program into the display mode. Once in this mode, various parameters can be retrieved and read but no changes are possible. Simultaneous pressing of **Select** and **Enter** keys activates the programming mode. In this mode, desired parameters can be chosen with **Select** key. The whole program can be scrolled by pressing **Select** key continuously.

3) The Enter key

This key returns the program into measurement mode after storing the programmed settings. If **Enter** is pressed during calibration, the latest measurement data is displayed.

3.2 Operating modes :

The instrument offers 3 different operating modes.

Programming mode : This mode can be enabled by pressing **"Select"** and **"Enter"** keys simultaneously. The prompt " Pr " indicates that programming mode is invoked.

Display mode : By pressing **"Select"** key alone enables entry in display mode. In this mode, all the operating parameters can be " read only " and no alterations are possible in any operating parameter.

Measurement mode : In this mode, the instrument carries out routine measurements according to operating parameters programmed. In order to enter programming mode at any point of time, **"Select "** and **"Enter"** keys need to be pressed simultaneously.

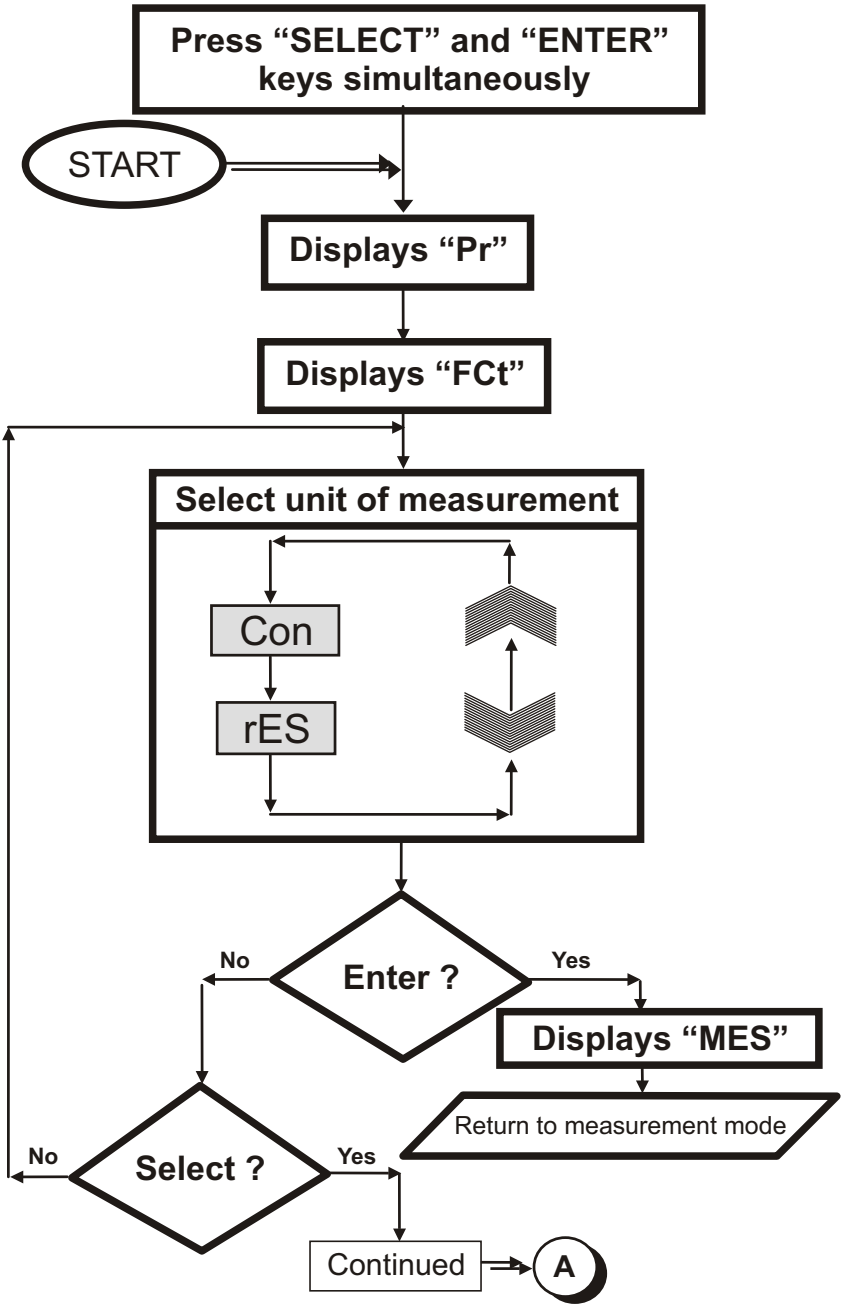
Note : Whenever programming is aborted to enter measurement mode, a prompt "MES" appears on the display for some time before displaying measured parameter.

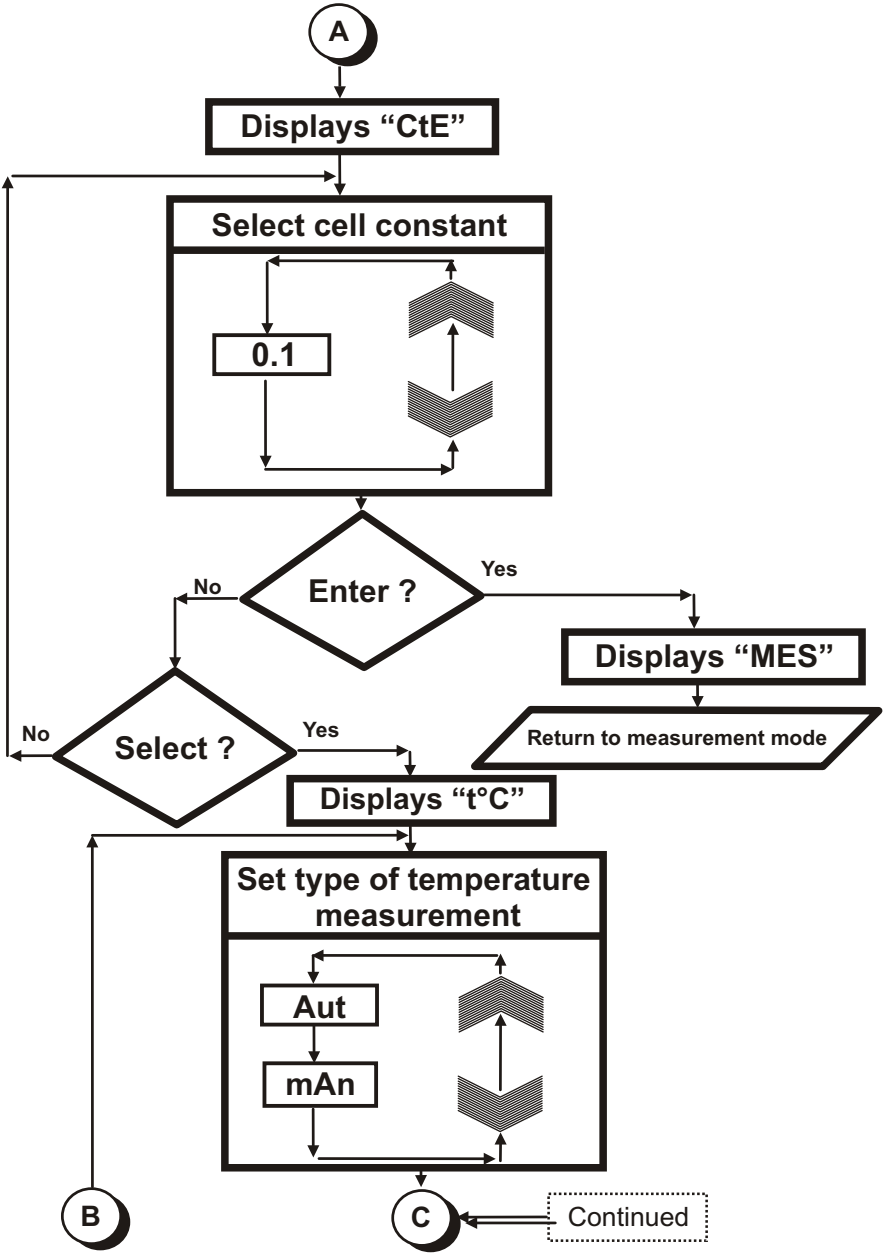
3.3 Programming

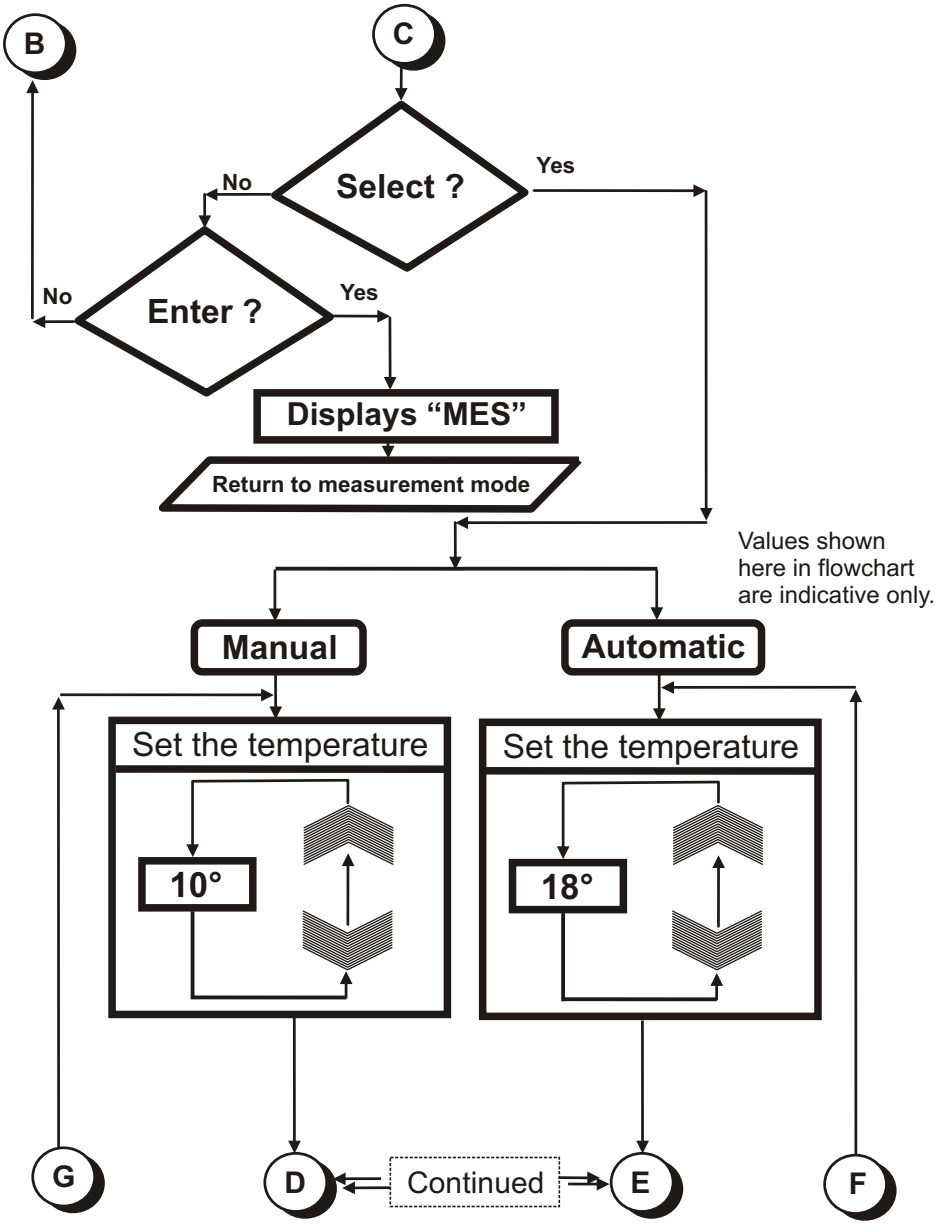
The programming is done with the 4 keys on the front facia. Various fonts displayed during the programming are shown in the following table to help understand the mode and parameter to be programmed.

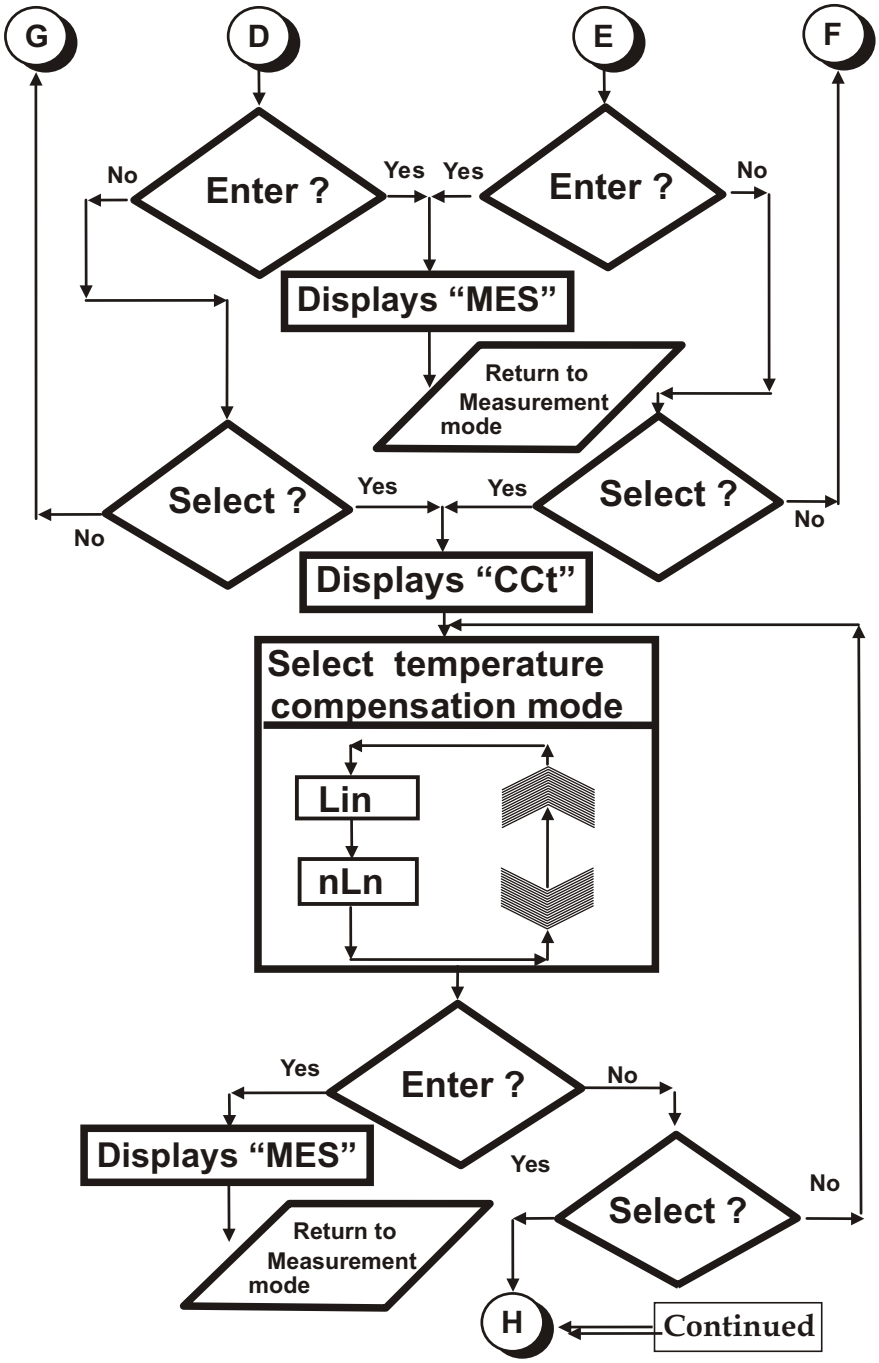
MES	Operating mode **"measurement"**
Pr	Operating mode **"programming"**
rd	Operating mode **"display"**
Fct	Unit of measurement
Con	Conductivity measurement
rES	Resistivity measurement
CtE	Cell constant
t °C	Temperature measurement mode
Aut	Automatic temperature measurement
Man	Manual temperature measurement
Lin	(Followed by **CCt**) Linear temperature compensation
nLn	Non linear temperature compensation
CCt	Temperature coefficient
SCL	Current out put mode
CAL	Calibration mode
Lin	(Followed by **SCL**) Analog output proportional to measurement
Log	Logarithmic output signal
HiS	Measuring range upper end
LoS	Measuring range lower end
Slo	Setting the slope
C=0	Setting the zero

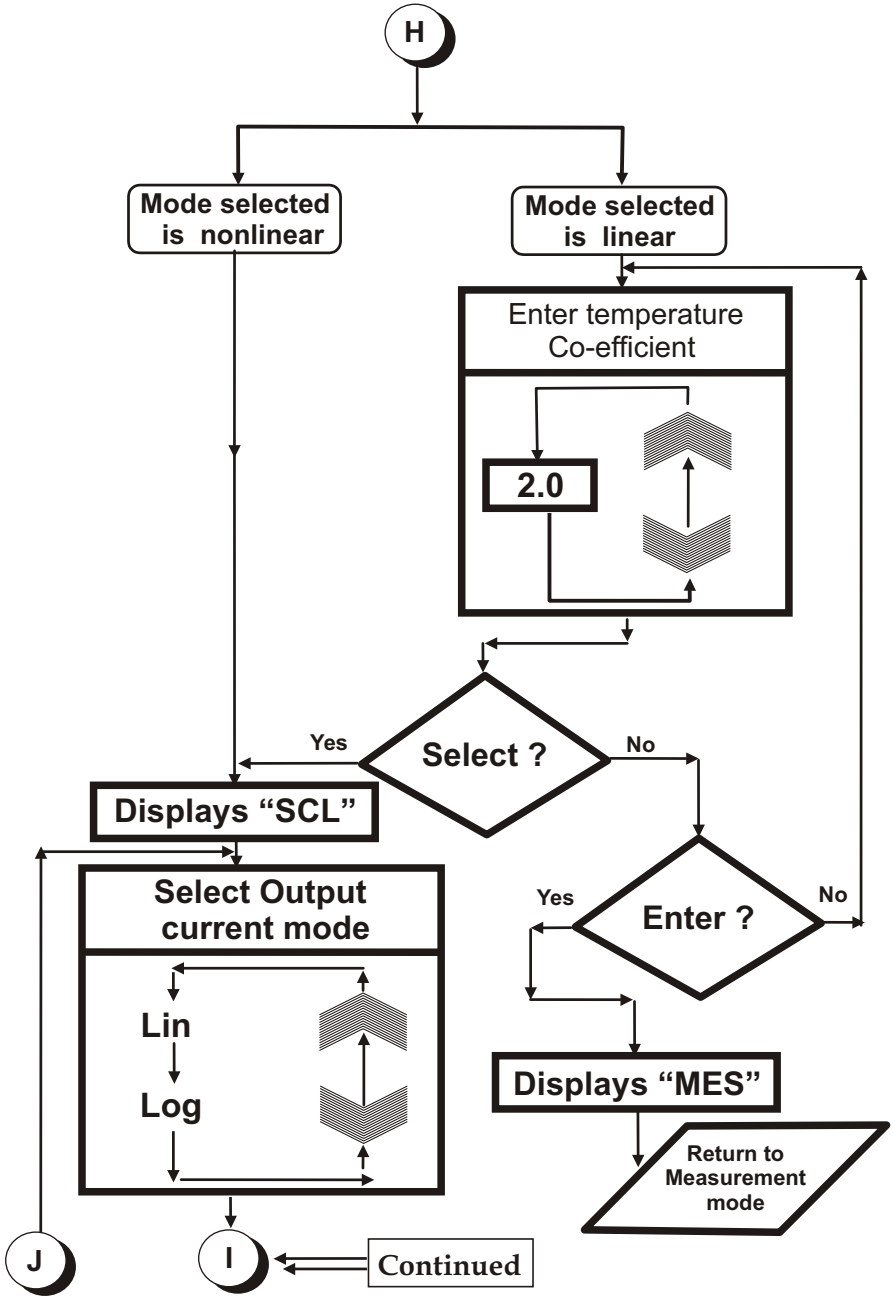
The programming mode is accessed by simultaneously pressing **Select** & **Enter.** The symbol Pr appears. The flow chart explains sequence of Programming various operating parameters

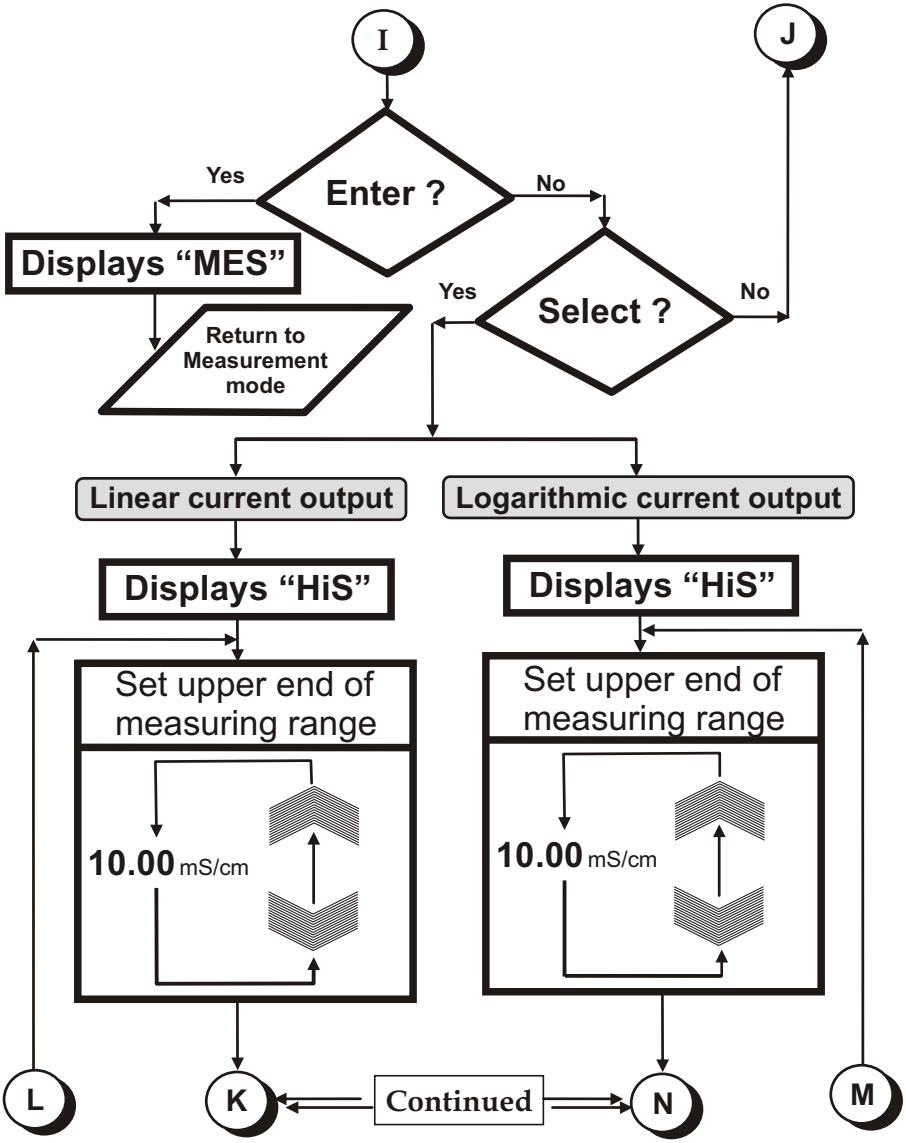

Press “SELECT” and “ENTER” keys simultaneously
START
Displays “Pr”
Displays “FCt”
Select unit of measurement
Con
rES
Enter ?
No
Yes
Displays “MES”
Return to measurement mode
Select ?
No
Yes
Continued
A

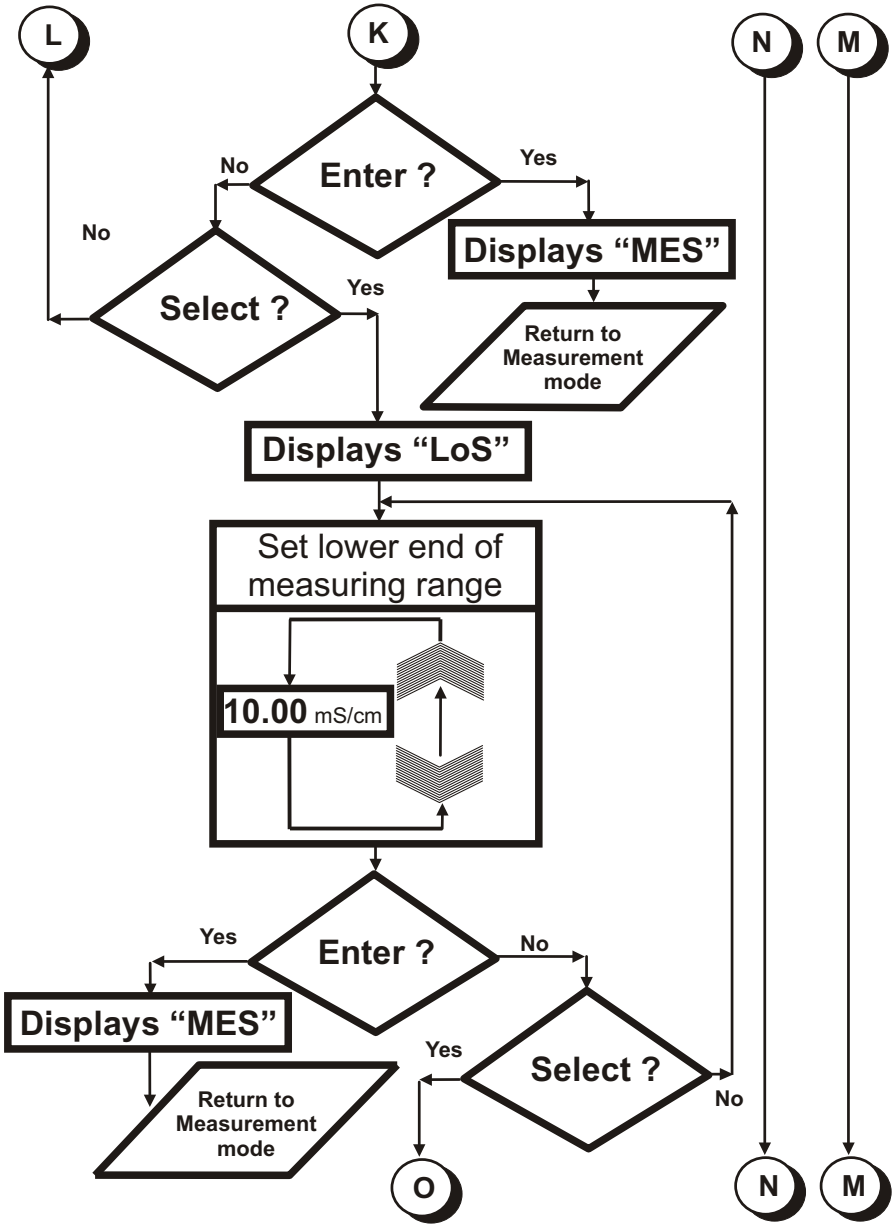

A
Displays “CtE”
Select cell constant
0.1
Enter ?
No
Yes
Displays “MES”
Return to measurement mode
Select ?
No
Yes
Displays “t°C”
Set type of temperature measurement
Aut
mAn
B
C
Continued

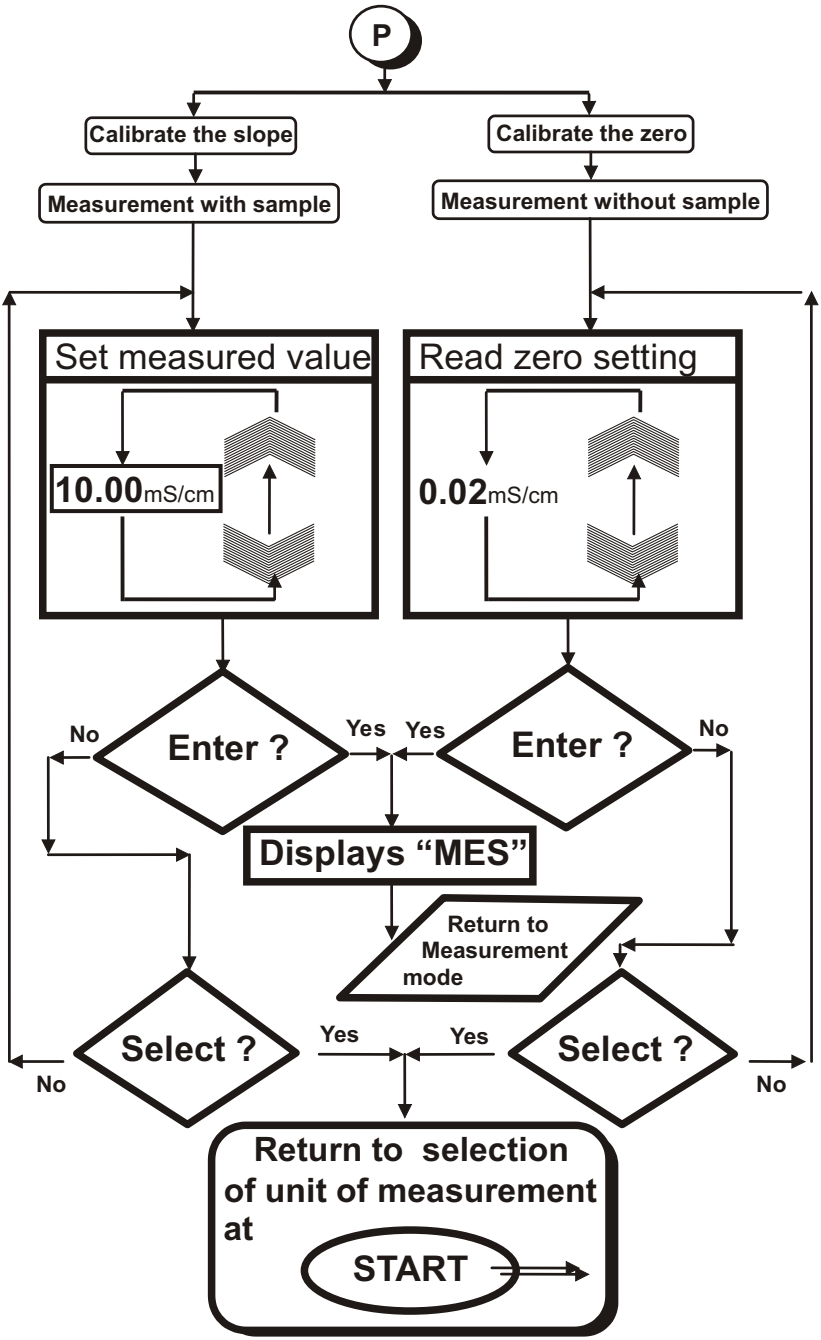

B
C
Select ?
No
Yes
Enter ?
No
Yes
Displays “MES”
Return to measurement mode
Values shown here in flowchart are indicative only.
Manual
Automatic
Set the temperature
Set the temperature
10°
18°
G
D
Continued
E
F


G
D
E
F
Enter ?
No
Yes
Yes
Enter ?
No
Displays “MES”
Return to
Measurement
mode
Select ?
Yes
Yes
Select ?
No
No
Displays “CCt”
Select temperature
compensation mode
Lin
nLn
Enter ?
Yes
No
Displays “MES”
Yes
Select ?
No
Return to
Measurement
mode
H
Continued


H
Mode selected is nonlinear
Mode selected is linear
Enter temperature Co-efficient
2.0
Yes
Select ?
No
Displays “SCL”
Select Output current mode
Lin
Log
Yes
Enter ?
No
Displays “MES”
Return to Measurement mode
J
I
Continued


I
J
Yes
Enter ?
No
Displays “MES”
Return to Measurement mode
Yes
Select ?
No
Linear current output
Logarithmic current output
Displays “HiS”
Displays “HiS”
Set upper end of measuring range
Set upper end of measuring range
10.00 mS/cm
10.00 mS/cm
L
K
Continued
N
M


L
K
N
M
Enter ?
No
Yes
Displays “MES”
No
Select ?
Yes
Return to Measurement mode
Displays “LoS”
Set lower end of measuring range
10.00 mS/cm
Enter ?
Yes
No
Displays “MES”
Return to Measurement mode
Yes
Select ?
No
O
N
M


P
Calibrate the slope
Measurement with sample
Calibrate the zero
Measurement without sample
Set measured value
10.00mS/cm
Read zero setting
0.02mS/cm
No
Enter ?
Yes
Yes
Enter ?
No
Displays “MES”
Return to Measurement mode
Select ?
Yes
Yes
Select ?
No
No
Return to selection of unit of measurement at
START

3.3.1 Selecting type of measurment

After the FCt message, the choice of either Conductivity or Resistivity measurement can be opted for. The selection entails selecting set of parameters stored in the memory of the instrument, defining the operating mode. The analog output, the probe co-efficient, the threshold values are handled in different ways according to whether the instrument is operating in Conductivity or Resistivity. Modification in measurement type enables rereading all the parameters corresponding to Conductivity or Resistivity.

3.3.2 Selecting cell constant

The CtE message demands the cell constant selection which can take four values as:-

K = 0.01 / cm
K = 0.10 / cm
K = 1.00 / cm
K = 10.0 / cm

Each cell constant has a defined permissible measuring scale. Hence if this value is changed, the previous measuring scale might go beyond the related measuring scale. The scale programmed has to be changed so as to be compatible to the cell constant value.

3.3.3 Selecting type of temp. compensations.

The message t °C asks for the type of temperature measurement as either automatic or manual. In Manual mode, the previously set temperature is displayed which can be set to desired value with the help of roll keys. In Auto mode, the temperature is measured through Pt 100 sensor.

3.3.4. Adjusting temperature:

The temperature displayed at any point of time is in °C. The value displayed in Manual mode can be set with roll keys.

3.3.5. Selecting type of temperature compensations:

The message CCt enables entry of temperature compensation as either linear or nonlinear. The two modes appear alternately if any roll key is pressed. The selection can be confirmed either by **Select** or **Enter** key.

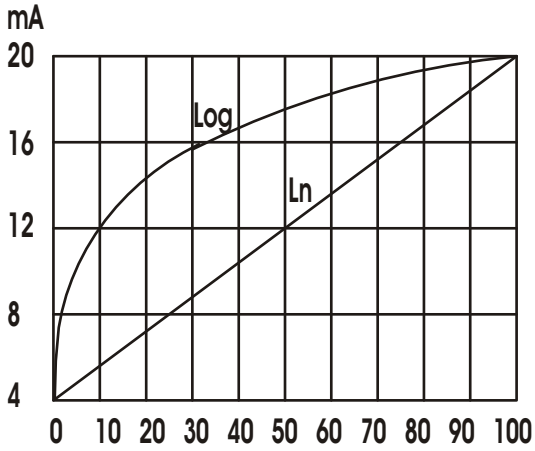
3.3.6. Adjusting temp. co-off:

If linear compensation is selected, the previously entered coefficient is displayed which can be changed between 0.0% / °C and 10.0% / °C with the help of roll keys.

3.3.7. Selecting type of current output:

The message SCl is for selecting output current type either linear i.e. proportional to the measurement or logarithmic i.e. log function of the measurement. The output current value follows the following functions :

LINEAR ANALOG O/P	LOGARITHMIC ANALOG O/P
Measure - Min $(16 \text{ X } \frac{\text{Measure - Min}}{\text{Max - Min}}) + 4$	Meausre $(8 \text{ x log } \frac{\text{Meausre}}{\text{Max / 100}}) + 4$



3.3. 8 Setting upper limits:

Upper limit of measuring range is entered after HiS message. The maximum value is dependent upon the cell constant value. Hence this value should be entered as per the defined limits shown in the table below.

Probe constant K / cm		Upper limit of measuring range Conductivity	Resistivity
0.01	Min	0.01 µS/cm	100 KΩ.cm
	Max	100 µS/cm	100 MΩ.cm
0.10	Min	0.10 µS/cm	10 KΩ.cm
	Max	1.00 mS/cm	10 MΩ.cm
1.00	Min	1.0 µS/cm	1 KΩ.cm
	Max	10.0 mS/cm	1 MΩ.cm
10.0	Min	10.0 µS/cm	0.1 kΩ.cm
	Max	100 mS/cm	0.1 MΩ.cm

This value corresponds to current of 20mA.

3.3.9. Setting lower limits:

Lower limit of measuring range is entered after LoS message. For linear analog output, this value can be selected between 90 % of upper limit and 1/ 10000 th of upper limit. For logarithmic analog output, it is always restricted to the value equal to the upper limit divided by 100 since the range of the scale covers two decades.

This value corresponds to current output of 4mA

3.3.10. For calibration refer section 3.5.

3.4 Read Mode

During READ mode or programming mode, the parameters are

displayed in following order :

1. Measurement type: Conductivity or Resistivity
2. Probe constant : expressed in unit / cm. (cm^{-1})
3. Temperature measurement type : automatic or manual.
4. Temperature value : expressed in °C.
5. Temperature compensation type : linear or logarithmic.
6. Temperature compensation co-efficient : expressed in % / °C.
7. Output current type : linear or logarithmic.
8. Upper limit of measurement scale.
   Lower limit of measurement scale

3.5 Calibration

For calibration go in to the programming of made sequence (see 3.3 & flow chart refer) and arrive at the CAL step and proceed as follows.

3.5.1.1 Slope calibration using known conductivity sample In the CAL made

Choose SLO.

Take a conductivity sample of known value. The value should be within the measuring range for the application.

Dip the conductivity cell in the solution and read the display value. Adjust the reading to a value of conductivity sample.

Press **SELECT** to remain in programming sequence or press **ENTER** to go to measurement made. This completes slope calibrations.

3.5.1.2. Zero calibration

For calibrating zero, arrive at CAL in the programming sequence.

Choose

C = 0

Remove the sensor (conductivity cell) from the solution & shake dry.

The zero calibration is complete on pressing either Select or Enter- on pressing Select the programme advances to next step while on pressing Enter the instrument goes into measurement mode.

3.5.1.3 Calibration using standard resistors.

The performance of the transmitter can be checked by calibration it with standard resisters.

The procedure for calibration is same as 3.5.1.1 but

i) Instead of using known conductivity sample, the cell is disconnected & a standard resistor is connected at the cell terminals.

ii) The instrument must be kept in Manual temp. comp. mode with temp. set at 25 °C. (It can be in auto mode, but then a resistance of 109.73Ω must be connected across pt100 terminals)

The value of the resistance to be connected calibrated using the formula below-

$R = K / \sigma$

R = i/p resistance in Ω

K = cell constant

σ = conductivity in Siemens/cm.

Observe the reading & current o/p at other conductivity values in the range. Use the same formula for calibrating resistance value to be connected at all terminals.

3.6 DO'S and DON'TS

- Don't ever try to adjust the potentiometers on CPU board. without genuine reason.
- Don't press the keys too hard while programming.
- Don't go in for Starting configuration mode without confirming the problem in calibration.
- Do ensure that the transmitter is mounted firmly on panel or pipe as application demands.
- Do check that the probe is clean and dry before immersing in process solution.
- Do use the proper tools while removing / making electrical connections

4 Fixing Problems

4.1 Troubleshooting

The MONEC transmitters being microprocessor based, offer self diagnostic and error reporting feature. This feature enables the user to identify the possible cause of the problem and decide the remedy for the same. The error messages and their meanings are as listed below.

PROBLEM	POSSIBLE	CAUSE REMEDIES
Er0	Error data recording	Invoke starting configuration mode and reprogram process parameters afterwards
Er1	Probe shorted <100Ω	Check the Pt 100 for short and rectify the fault or replace the element
Er2	Temperature sensor open or short	Check the Pt 100 resistance across its leads and the proper connection on PCB or replace the element if found open
Er3	Temperature compensation impossible	Check for proper connection between CPU and P.S. board and replace CPU board if problem is not solved
Er4	A/D conversion error	Check for proper connection between CPU and P.S. board and replace CPU board if problem is not solved
Er5	Calibration error	Check the measurement range programmed and redo the calibration

NOTE : Messages other than Er1 and Er5 remain displayed until Enter key is pressed.

4.2. Calibration of current o/p

The current o/p is calibrated & does not required to the adjusted again. Hence carry out this operation only if you find the current o/p outside the specified according limits. For calibrating current o/p the starting configuration mode must be accessed.

4.2.1 : Starting Configuration

Starting configuration mode can be accessed by pressing roll keys (increment and decrement) simultaneously and held pressed before powering the instrument.

This mode allows following settings in sequential steps

- Parameter initialisation.
- Choice of language for messages.
- Calibration of display.
- Calibration of current output.
- Calibration of temperature measurement. (This can be done in regular programming mode as well.)

Parameter initialisation : This is the first step in starting configuration mode. On entry in this mode, The message “Par” appears on the display and default values are loaded in system scratch pad memory in automatically. These default values are as listed below:-

Operating mode	: Conductivity
Probe Coefficient	: 0.01 cm^{-1}
Temperature measurement	: Manual
Temperature value	: 25°C
Slope	: 100 %
Zero conductivity correction	: 0
Temperature compensation	: Linear
Temperature compensation coefficient	: 2.0 %/ °C
Measurement scale	: Linear
Measurement scale maximum	: 100µS/cm: 100MΩcm
Measurement scale minimum	: 2 µS/cm: 1 MΩcm

NOTE: Since the entry in starting configuration mode enables storage of default values, the previous entries done during programming mode are overwritten. Hence after exit from starting configuration mode, the programming has to be done again.

4.2.1.2 Choice of language of messages :

Here the language option is provided for the abbreviated messages displayed during programming and calibration. The selection can be made using roll keys. The display **"Fr"** means French and **"En"** means English language. Only a few messages are affected by this choice.

Messages in French	Messages in English	Expression
LEC	rD	Read only mode
ECH	SCL	Measurement range
SuP	HiS	Measurement range upper limit
InF	LoS	Measurement range lower limit

4.2.1.3 Calibration of display :

At this stage, the display calibration can be done in sequence as follows

Disconnect the probe(or conductivity simulator) from transmitter.

Display **"P1"** will appear followed by value of conductivity.

Adjust potentiometer **'P1'** on CPU board till display shows `0'

Now press **"Enter"** key.

Display **"P2"** will appear followed by conductivity value.

Adjust potentiometer **'P2'** till 500 is displayed.

At this stage **Select** should be pressed to move to next step i.e. Calibration of current output or **Enter** should be pressed to restart from the first step of **'P1'** adjustment.

4.2.1.4 Calibration of current output :

In this step, the current output corresponding to beginning & end of the measurement range can be adjusted.

The message **"I = 4 "** is displayed followed by adjustment coefficient.

Adjust the coefficient with roll keys until consumed current is read as 4 mA.

Now press **Enter** key.

The message **"I = 20 "** will be displayed followed by another coefficient.

Adjust this coefficient with roll keys until consumed current is read as 20 mA.

At this stage **Select** should be pressed to return to measurement mode or **Enter** should be pressed to restart from 4 mA current adjustment.

4.2.1.5 Calibration of temperature measurement :

In this step, the temperature measurement in Auto mode can be calibrated.

The message **"t °C"** is displayed followed by the measured temperature in Auto mode.

With the help of scroll keys, the displayed value can be adjusted.

Now press **Select** to return to measurement mode or press **Enter** which enables restart at current calibration step.

4.3. Spare

Part code no.	Description
C2013731	CPU board
C2013733	Power supply board 8964
C2018807	Cable gland
C2013776	Instruction manual
C2013666	Power Supply 8964Ex

4.4 Service

If you still need help, please contact your nearest Forbes Marshall representative. The addresses and contact numbers of our major branches are listed on the back of this manual. They'll be happy to direct you to any representative in your area, or provide service themselves. Please record all instances of field service problems and actions taken in the space below.

Product Serial Number :

Date	Problem	Action Taken	Serviced by

4.5 Field Service Report

This form should be used to report field problems. A copy should be filled out by your Forbes Marshall customer service engineer. Any servicing which requires the product to be sent back to Works cannot be completed without this report. If the product is returned to our Works, you should include either the original excise gate pass or our invoice number and date.

If you'd prefer an estimate before proceeding with repair:

You should clarify on the form whether you would like to see an cost estimate before we make any necessary repairs. If you indicate that an estimate is required, our Works Engineer will complete Part 6 of the form and return it to you. If this estimate is satisfactory, you should approve the estimate and return the approved form to your Forbes Marshall representative. Only then will servicing proceed.

Forbes Marshall

Field Service Report			
Report # :	**Date :**		
Division			
1) Customer Information			
Customer Name :			
Address :			
Site			
Contact Person :		Phone :	
Reference:			
2) Product Information			
Product Description :			
Serial Number :	Original Invoice #	Date :	
Input/Inlet Details :			
Output/Outlet Details :			
The Product is	☐ On-line	☐ Off-line	
Connections	☐ Flanged	☐ Screwed	☐ Welded
Mounting Details :			
3) Application Information			
Process Media :			
Pressure :		Temperature :	
Sensor Details (If any) :			
Mounting Details :			

4) Observed Problems or Symptoms

5) Proposed Action

◊ Repair at Site	◊ Return to Works	Estimate First or Under Warranty

Field Engineer's Sign :Customer's Signature :

6) To be Filled in for Estimate Purpose

Estimated Cost :

List any imported spares which must be provided by Customer :

Signature of MFG/CSD Engineer.

7) Customer's Endorsement

We accept the above repair estimate

Signature & Stamp.

5 Notes

Notes

Solutions Engineering

If You Need Help...

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